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EXAMINATION OF ISSUES RELATED TO TWO-  
CAR REGIONAL EMISSION CONTROL STRATEGIES:  
VOLUME I - EXECUTIVE SUMMARY

Merrill G. Hinton, et al

Aerospace Corporation

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VOLUME I -  
EXECUTIVE SUMMARY**

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U.S. ENVIRONMENTAL PROTECTION AGENCY  
Office of Air and Waste Management  
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## FOREWORD

This report, prepared by The Aerospace Corporation for the Environmental Protection Agency, Division of Emission Control Technology, presents the results of an examination of the issues related to two-car regional emission control strategy implementation.

The comments and statements attributed herein to domestic and foreign auto companies and state or city air quality control authorities were expressed either during data acquisition visits or by letter or telephone correspondence in the period 7 March 1973 through 30 March 1973.

The results of this study are presented in two volumes. Volume I, the Executive Summary, presents a brief, concise review of important findings and conclusions in the Highlights and Executive Summary sections. Volume II, the Technical Discussion, provides a detailed discussion of each study topic and is of interest primarily to the technical specialist. In Volume II, passenger car population location, air quality effects, and car movement and migration factors are delineated in Section 2. A summary of potential two-car strategy compliance assurance measures, current and new procedures, and associated problem areas is presented in Section 3. The position of the auto manufacturers with regard to two-car strategy implementation, with particular emphasis on ability to produce, market, and service two new car classes, is discussed in Section 4. The reactions of potentially involved state or regional air quality control authorities with regard to compliance assurance capability and air quality impact under a two-car strategy are treated in Section 5. Possible effects of the two-car strategy on the vehicle user are summarized in Section 6. Section 7 contains a brief discussion of possible effects on the used-car and replacement parts industries. Appendix A, Section 8, contains a listing of the companies/agencies contacted in the data acquisition activity. Appendixes B through G contain backup information relative to the study.

## ACKNOWLEDGMENTS

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The following technical personnel of The Aerospace Corporation made valuable contributions to the examination performed under this contract.

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## HIGHLIGHTS

An examination and summarization was made of available information pertaining to issues relevant to potential implementation of a one-year two-car regional emission control strategy for the 1975 model year. Two different two-car strategy options were specified by EPA for examination. The first, or California-only strategy option, would require that new cars sold in the State of California meet a low-emission standard such as the 1975 Federal emissions standards, while vehicles sold in all other states would meet a higher-emission standard such as the 1973/74 Federal emissions standards. The second, or California-plus strategy option, increases the area of stricter control by adding up to 16 air quality control regions to California as areas requiring the sale of low-emission 1975 model cars; again, the rest of the United States would use higher-emission 1975 model cars.

Assessment of the available data as of the time of data acquisition visits and technical discussions (March 7 to March 30, 1973) resulted in the following findings.

1. The California-only two-car strategy would require approximately 11 percent of the 1975 model year passenger cars sold in the United States to meet the lower emission standards. Most of these cars would require catalysts to do so. This would represent from 5 to 10 percent of the United States new car sales of individual domestic auto manufacturers and up to 30 percent of the United States new car sales of individual foreign auto manufacturers.
2. The California-plus two-car strategy could require up to 33 percent of the 1975 model year passenger cars sold in the United States to meet the lower emission standards. This would represent from 24 to 33 percent of the United States new car sales of individual domestic auto manufacturers and up to 52 percent of the United States new car sales of individual foreign car manufacturers.
3. Under either of these one-year control strategies there is no dramatic improvement in air quality in the control regions with the lower

emission cars. The regions would have an approximately 10 percent (1-3 ppm) reduction in CO and an approximately 5 percent (0.001-0.02 ppm) reduction in oxidant level beyond the level that would result if only 1974 emission standards were in effect throughout the 1975 model year.

4. In terms of oxidant level reduction benefits resulting from compliance with 1975 emissions standards, the State of California would appear to benefit the most by being a control region. Four of the California cities are among the seven cities exhibiting the greatest oxidant level reduction, and three of these cities (Los Angeles, San Diego, and San Francisco) are among the four cities with the greatest oxidant reduction potential.
5. With the exception of Chrysler, which opposes any strategy requiring the use of catalysts, the domestic auto manufacturers generally favor the California-only two-car strategy. This strategy would only require catalysts on from 5 to 10 percent of each manufacturer's new 1975 cars for United States sales. The same companies are generally opposed to the California-plus strategy, primarily on the basis of assembly, distribution, and marketing difficulties. If the California-plus strategy were implemented, however, the opinion of these companies is that any added geographical areas should be as large as possible.
6. Foreign automakers generally oppose any mandatory two-car strategy; they prefer optional phasing-in processes for catalysts. With regard to the California-only strategy they feel that the percentage of their United States car sales in California is much too large to represent a reasonable test sample size (e.g., Nissan ~30%, Toyota ~24%, Volkswagen ~17%). Their distribution and marketing problems would further escalate under the California-plus strategy. However, their car sales in California are a relatively small portion of their overall passenger car output (e.g., Nissan ~5.01%, Toyota ~4.67%, Volkswagen ~5.38%).
7. Two classes of cars can be produced; however, there is an associated degree of difficulty which varies inversely with the size of the auto company (being more of a problem as the company gets smaller). The California-only strategy, aside from any catalyst-system-unique production problems, is not unusual since the auto companies have produced California-unique emission control systems since 1966. The California-plus strategy would require that more vehicle assembly plants become involved in the manufacture of catalyst-equipped cars and would entail additional complexity. Additional assembly plants would have to be converted; cross-shipping of cars might also be required (at additional consumer expense).

8. Two classes of cars can be marketed and serviced; however, there is a major impact on the ability to do so resulting from the number of control regions involved. The California-only strategy, with the exception of catalyst-system-unique parts storage and service requirements, has been in effect since 1966 with marketing and servicing groups set up to handle the California region and, again, is not unusual. The California-plus strategy may be highly disruptive of distribution, sales, and service channels unless the additional areas are sufficiently large. Although not an impossible task, it could be very difficult to provide a full model mix of new cars and adequate service to all cities potentially involved in such a strategy. The degree of difficulty, of course, increases as control areas are added.
9. The car pricing policy under the two-car strategy has not as yet been determined by the manufacturers (e.g., adding catalyst cost increase to cars so equipped vs spreading cost increase over all cars). It has been suggested by General Motors that the catalyst could best be handled as a "mandatory option" as was done in California for other emission control components. According to Ford, the warranty interpretation under the two-car strategy would remain as is (replace defective parts).
10. Benefits claimed for the California-only strategy by the auto industry are primarily economic in nature (e.g., more learning time, lessened assembly-line impact, warranty-recall cost statistics accumulated at limited risk, etc.). The companies also feel that service, parts distribution, and training can be more thoroughly accomplished and evaluated in a limited area.
11. Disadvantages attributed to the California-only strategy by the auto industry include: the one-year time period may not permit enough mileage accumulation on catalyst systems, and the California sales percentage of some imports is much larger than that of domestic automakers, thus posing a more severe burden on the foreign automakers.
12. No benefits are claimed for the California-plus strategy by the auto industry. The companies feel that this strategy has several inherent disadvantages, including: it increases manufacturing and distribution problems; it involves a complex and difficult enforcement system; it is very disruptive of normal channels of distribution, sales, service, and enforcement; and any areas added to California would have to be large geographically since the strategy gets less and less feasible as the control regions get smaller.

13. The principal impact on the purchaser of a catalyst-equipped car in the control region is economic in nature. In addition to the higher purchase price (unless cost increases are spread over all cars), the owner of a low-emission catalyst car is subject to the loss of the extra cost of the catalyst system on resale if sold outside of the control region. Also, if higher-emission non-catalyst 1975 cars were permitted into control regions, as used cars without catalyst retrofit, such cars could undersell the catalyst-equipped cars. This could create a strong demand within the control region for higher-emission 1975 used cars from outside the region, and make the resale of catalyst-equipped cars difficult.
14. Owners of low-emission cars may encounter difficulties in obtaining replacement parts if problems develop on trips outside the control region (24 hours delays are likely, in some cases), and service in such areas from mechanics with little or no experience on the low-emission system may be of poor quality.
15. Catalyst-equipped cars require unleaded gasoline to function properly in reducing emissions and to prevent degradation with lifetime. In recognition of this requirement, present Federal regulations call for unleaded gasoline to be available throughout the nation by July 1974. Supply of unleaded gasoline outside a control region was cited as an item of major concern for users of catalyst-equipped low-emission cars on trips outside a control region, since it will be difficult to ensure that all stations stock a fuel for which there may be little demand.
16. Any requirement to retrofit higher-emission 1975 model cars (non-catalyst) with 1975 low-emission vehicle control systems (catalyst) would be a severe one. It may be physically possible, but it would be economically impractical unless both emission control systems were essentially the same except for the catalytic converter. This means that retrofit to factory-installed system features and performance levels has to be planned for in advance of 1975 model year production commencement.
17. Most states foresee many problems in administering the two-car strategy, if it were based on regional control within a state; on that basis, statewide control would be generally preferred. On the other hand, since many of the air quality regions have their automotive pollution problems concentrated in smaller central business district areas, the states also foresee many objections to having stringent control implemented outside of those areas. If price differences between low-emission and higher-emission cars were large, the problems associated

with a metropolitan area regional control strategy would be accentuated. The general feeling was that it would not be worth the difficulty of setting up complicated administrative procedures to assure compliance with the short-lived, one-year, two-car strategy.

18. Most states or regions would favor the California-only two-car strategy if their air quality implementation plans were also delayed for one year (exceptions are New York City and the District of Columbia). Although their air quality would be adversely affected, the impact is considered small.
19. California has serious reservations about being the only state in the nation with catalyst-equipped cars in 1975, unless such cars were to be in general use in other states in the following year. If this were done, California would accept the California-only strategy for just one-year, but only if EPA enforced its mandate for a supply of unleaded gasoline throughout the country.
20. California is the only state that has existing procedures for administering a car control program to standards other than Federal nationwide emission standards. California presently has an assembly-line inspection program and requires a certificate of compliance with California emission standards as a condition to sale and registration of new cars sold in the state. Also, California's size, population distribution, and natural borders tend to enhance two-car strategy control feasibility.
21. All states (including California) lack the ability to strictly enforce the two-car strategy on a 100 percent compliance basis. There are numerous loopholes in existing registration laws (lack of verification of vehicle domicile, "used-car" provisions, etc.) as well as fleet-sale (sold in one state, delivered and used in another) and border dealer problems. The time required to pass the necessary laws to completely close existing loopholes and to set up enforcement provisions is most likely not compatible with the 1975 model year time frame.

Some statements made here and elsewhere throughout the report may appear to endorse or disapprove of one facet or another of two-car strategy implementation. This is a result of attempting to make the fullest possible identification and discussion of the pro's and con's of the many issues potentially associated with the two-car strategy. Such discussions naturally result in positive or negative statements when relating fact

or opinion from a given point of view, and the broadest possible spectrum of affected parties was addressed in this study. Individually and in total, however, this study and its issue-oriented subparts do not in any way represent an endorsement or lack thereof, or a recommendation for or against a two-car strategy of any type.

## CONTENTS

|                                                  |     |
|--------------------------------------------------|-----|
| FOREWORD .....                                   | iii |
| ACKNOWLEDGMENTS .....                            | iv  |
| HIGHLIGHTS .....                                 | v   |
| EXECUTIVE SUMMARY .....                          | 1   |
| 1. Introduction .....                            | 1   |
| 2. Car Population Location and Effects .....     | 2   |
| 3. Potential Compliance Assurance Measures ..... | 10  |
| 4. Auto Industry Considerations .....            | 14  |
| 5. State or Regional Considerations .....        | 18  |
| 6. Vehicle User Effects .....                    | 21  |
| 7. Corollary Issues .....                        | 25  |

## FIGURES

|    |                                                                                                      |   |
|----|------------------------------------------------------------------------------------------------------|---|
| 1. | Air Quality Control Regions . . . . .                                                                | 2 |
| 2. | Car Registrations by Control Region (Percent of<br>United States Passenger Car Population) . . . . . | 3 |
| 3. | Car Registrations by Control Region (Percent of<br>State(s) Passenger Car Population) . . . . .      | 4 |
| 4. | Example of High CO Concentrations in Confined<br>Local Area (Denver) . . . . .                       | 9 |

## TABLES

|    |                                                                            |    |
|----|----------------------------------------------------------------------------|----|
| 1. | Car Registration Summary (by Air Quality Control<br>Region) . . . . .      | 3  |
| 2. | 1971 Car Registrations--Domestic Auto Manufacturers . . . . .              | 5  |
| 3. | 1971 Car Registrations--Foreign Auto Manufacturers . . . . .               | 5  |
| 4. | Air Quality Benefits--CO (by Air Quality Control<br>Region) . . . . .      | 6  |
| 5. | Air Quality Benefits--Oxidant (by Air Quality<br>Control Region) . . . . . | 7  |
| 6. | Cities with Greatest Air Quality Improvement--<br>No Delay . . . . .       | 8  |
| 7. | Car Movement Summary . . . . .                                             | 11 |

## EXECUTIVE SUMMARY

### 1. INTRODUCTION

This report presents a summarization and examination of available information pertaining to issues relevant to the potential implementation of a one-year, two-car regional emission control strategy for the 1975 model year.

Two, two-car strategy options were specified by EPA for examination:

- a. "California-only" strategy: the use of low-emission cars in the State of California; all other states use higher-emission cars (low-emission cars conform to 1975 Federal emissions standards; higher-emission cars conform to 1973/74 Federal emissions standards).
- b. "California-plus" strategy: the use of low-emission cars in the State of California plus other selected areas and/or basins; all other states and/or areas use higher-emission cars.

Sixteen air quality control regions (in addition to California) were considered for the California-plus strategy option; they are illustrated in Figure 1.

The principal topics covered in this report are the identification and discussion of the pro's and con's of issues which may be basic to the implementation of the two-car emission control strategy. Emphasis has been directed toward the results of potential implementation of such a strategy in the key areas of:

- a. Possible administrative measures which might be used to assure compliance with the strategy.
- b. Resultant impact on the automobile industry, the government, and the vehicle user.
- c. Emission level trends to be expected in areas in which the strategy is implemented.

No conclusions or recommendations as to the desirability of implementing the two-car strategy were contemplated or made.



Figure 1. Air Quality Control Regions

This volume (Volume I) summarizes the more pertinent information from this examination of issues. Further details are given in the main body of the report (Volume II).

## 2. CAR POPULATION LOCATION AND EFFECTS

Under the two-car strategy, the existing passenger car population (number and location) in the United States was examined to determine its effect on potential 1975 new car sales distributions, metropolitan area air quality, and car migration factors.

### 2.1 PASSENGER CAR REGISTRATIONS

Table 1 lists the passenger car registrations (domestic, foreign, and total) for the air quality control regions of Figure 1, based on R. L. Polk and Company data as of July 1972. Also shown in the table are the individual percentages of the United States total registration in each control region, and the cumulative percent registration of all 17 control regions examined (approximately 33 percent). Figure 2 illustrates the

Table 1. Car Registration Summary (by Air Quality Control Region)

| AIR QUALITY CONTROL REGION (AQCR) | PASSENGER CAR REGISTRATIONS |           |            | PERCENT OF U.S. TOTAL |            |
|-----------------------------------|-----------------------------|-----------|------------|-----------------------|------------|
|                                   | DOMESTIC                    | FOREIGN   | TOTAL      | INDIVIDUAL            | CUMULATIVE |
| 1 CALIFORNIA (entire state)       | 7,534,754                   | 1,809,696 | 9,344,450  | 10.81                 | 10.81      |
| 2 HOUSTON, TEX                    | 870,449                     | 86,742    | 957,191    | 1.11                  | 11.92      |
| 3 PHOENIX/TUSCON, ARIZ            | 624,307                     | 90,542    | 714,849    | 0.83                  | 12.75      |
| 4 SOUTH LA & SOUTHEAST TEX        | 1,120,510                   | 99,740    | 1,220,250  | 1.41                  | 14.16      |
| 5 BOSTON, MASS                    | 1,129,069                   | 140,617   | 1,269,686  | 1.47                  | 15.63      |
| 6 PHILADELPHIA, PA                | 1,268,820                   | 153,737   | 1,422,557  | 1.65                  | 17.28      |
| 7 PORTLAND, ORE                   | 674,244                     | 132,684   | 806,928    | 0.93                  | 18.21      |
| 8 FAIRBANKS, ALASKA               | 11,108                      | 2,800     | 13,908     | 0.02                  | 18.23      |
| 9 BALTIMORE, MD                   | 769,624                     | 91,155    | 860,779    | 1.00                  | 19.23      |
| 10 NEW YORK CITY/NEW JERSEY       | 5,944,995                   | 772,376   | 6,717,371  | 7.77                  | 27.00      |
| 11 SPOKANE, WASH                  | 204,831                     | 27,406    | 232,237    | 0.27                  | 27.27      |
| 12 DENVER, COL                    | 552,023                     | 101,750   | 653,773    | 0.76                  | 28.03      |
| 13 WASHINGTON, D.C.               | 1,090,503                   | 76,916    | 1,167,419  | 1.35                  | 29.38      |
| 14 PITTSBURGH, PA                 | 1,005,013                   | 94,212    | 1,099,225  | 1.27                  | 30.65      |
| 15 SEATTLE, WASH.                 | 718,153                     | 134,373   | 852,526    | 0.99                  | 31.64      |
| 16 MINNEAPOLIS/ST PAUL, MINN      | 930,095                     | 66,153    | 996,208    | 1.15                  | 32.79      |
| 17 SALT LAKE CITY, UTAH           | 275,233                     | 41,074    | 316,307    | 0.37                  | 33.16      |
| AQCR TOTALS                       | 34,723,691                  | 3,921,973 | 38,645,664 | 33.14                 |            |
| U.S. TOTALS                       | 77,701,402                  | 8,737,555 | 86,438,957 |                       |            |
| AQCR, % U.S. TOTAL                | 31.82                       | 44.89     |            |                       |            |

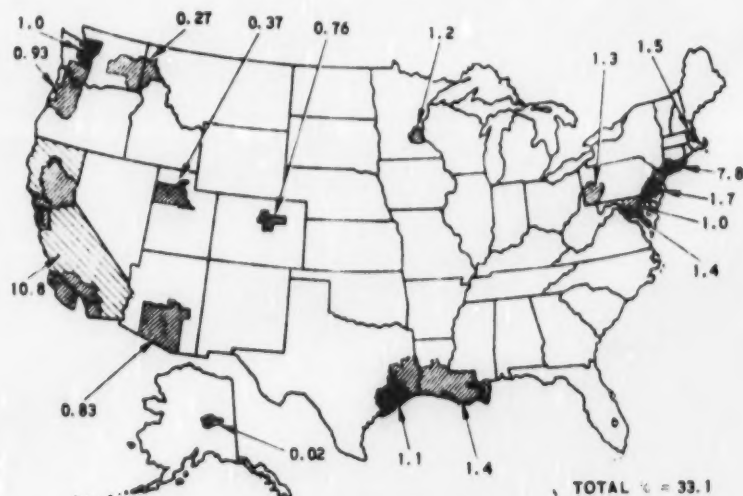


Figure 2. Car Registrations by Control Region (Percent of United States Passenger Car Population)

geographical distribution of car registrations by control region, as a percent of the total United States passenger car population. As can be seen, aside from the California (approximately 11 percent) and the New York City/ New Jersey regions (approximately 8 percent), the individual control regions do not have a large car population (less than 2 percent in every case).

Figure 3 presents similar data for each control region; however, in this case the percent of the states' passenger car registration included in the region is depicted. Where a state has counties in more than one air quality control region, the percent of the registrations resulting from all control regions is also shown. (For example, 75.8 percent of the passenger car registrations in the State of Washington are in the Seattle, Portland, and Spokane control regions.)

Tables 2 and 3 list the percent of 1971 new car registrations for selected domestic and foreign auto manufacturers as a function of total new car sales in the air quality control region and of total new car sales of the manufacturer. California sales of the domestic manufacturers range from

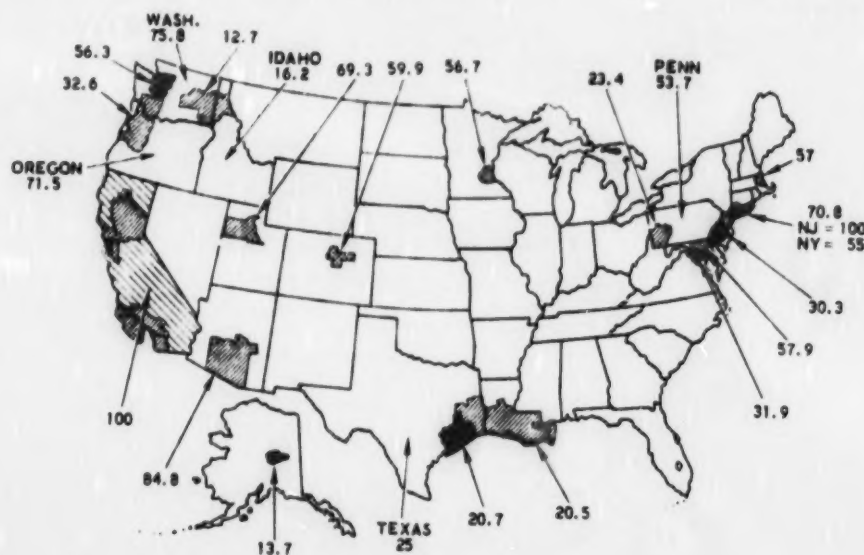


Figure 3. Car Registrations by Control Region (Percent of State(s) Passenger Car Population)

Table 2. 1971 Car Registrations--Domestic Auto Manufacturers

| AIR QUALITY<br>CONTROL<br>REGION<br>(AQCR) | GENERAL MOTORS<br>% |             |                    | FORD<br>% |               |                      | CHRYSLER<br>% |              |                     | AMERICAN MOTORS<br>% |             |                    |
|--------------------------------------------|---------------------|-------------|--------------------|-----------|---------------|----------------------|---------------|--------------|---------------------|----------------------|-------------|--------------------|
|                                            | AQCR                | GM<br>TOTAL | CUM<br>GM<br>TOTAL | AQCR      | FORD<br>TOTAL | CUM<br>FORD<br>TOTAL | AQCR          | CHR<br>TOTAL | CUM<br>CHR<br>TOTAL | AQCR                 | AM<br>TOTAL | CUM<br>AM<br>TOTAL |
| CALIFORNIA                                 | 26.78               | 5.34        | 5.34               | 24.34     | 9.32          | 9.32                 | 11.36         | 7.46         | 7.46                | 2.04                 | 7.34        | 7.34               |
| HOUSTON                                    | 42.94               | 1.11        | 6.45               | 25.61     | 1.27          | 10.59                | 13.44         | 1.14         | 8.60                | 1.44                 | 0.67        | 8.01               |
| PHOENIX/TUCSON                             | 33.09               | 0.48        | 6.93               | 25.76     | 0.71          | 11.30                | 13.87         | 0.66         | 9.26                | 3.16                 | 0.82        | 8.83               |
| SO. LA/TEXAS                               | 41.22               | 1.20        | 8.13               | 26.31     | 1.47          | 12.77                | 15.60         | 1.47         | 10.73               | 1.16                 | 0.61        | 9.44               |
| BOSTON                                     | 38.35               | 1.37        | 9.50               | 24.12     | 1.65          | 14.42                | 16.15         | 1.89         | 12.62               | 1.22                 | 0.78        | 10.22              |
| PHILADELPHIA                               | 40.97               | 1.40        | 10.90              | 21.82     | 1.44          | 15.86                | 15.28         | 1.73         | 14.35               | 3.24                 | 2.00        | 12.22              |
| PORTLAND                                   | 25.44               | 0.41        | 11.31              | 22.39     | 0.70          | 16.56                | 12.38         | 0.66         | 15.01               | 3.21                 | 0.94        | 13.16              |
| FAIRBANKS                                  | 25.08               | 0.008       | 11.32              | 23.46     | 0.015         | 16.58                | 13.29         | 0.015        | 15.03               | 4.67                 | 0.029       | 13.19              |
| BALTIMORE                                  | 44.89               | 1.14        | 12.46              | 29.84     | 1.46          | 18.04                | 16.71         | 1.40         | 16.43               | 2.66                 | 1.23        | 14.42              |
| N.Y./N.J.                                  | 41.41               | 7.27        | 19.73              | 19.99     | 6.74          | 24.78                | 17.39         | 10.06        | 26.49               | 1.99                 | 6.32        | 20.74              |
| SPOKANE                                    | 30.80               | 0.11        | 19.84              | 22.75     | 0.16          | 24.94                | 16.06         | 0.20         | 26.69               | 3.31                 | 0.22        | 20.96              |
| DENVER                                     | 28.99               | 0.42        | 20.26              | 25.07     | 0.70          | 25.64                | 13.20         | 0.63         | 27.32               | 2.86                 | 0.75        | 21.71              |
| WASH. D.C.                                 | 36.20               | 1.30        | 21.56              | 25.09     | 1.73          | 27.37                | 15.92         | 1.88         | 29.20               | 1.89                 | 1.22        | 22.93              |
| PITTSBURGH                                 | 37.74               | 1.09        | 22.65              | 23.50     | 1.30          | 28.67                | 13.66         | 1.30         | 30.50               | 3.41                 | 1.77        | 24.70              |
| SEATTLE                                    | 26.72               | 0.38        | 23.03              | 25.11     | 0.69          | 29.36                | 13.28         | 0.63         | 31.13               | 2.02                 | 0.52        | 25.22              |
| MINNEAPOLIS                                | 40.68               | 0.91        | 23.94              | 26.82     | 1.15          | 30.51                | 17.14         | 1.26         | 32.39               | 3.73                 | 1.51        | 26.73              |
| SALT LAKE CITY                             | 30.50               | 0.19        | 24.13              | 26.82     | 0.33          | 30.84                | 14.43         | 0.30         | 32.69               | 2.43                 | 0.28        | 27.01              |
|                                            | 35.38               | 24.14       | --                 | 23.56     | 30.84         | --                   | 14.56         | 32.70        | --                  | 2.19                 | 27.03       | --                 |

Table 3. 1971 Car Registrations--Foreign Auto Manufacturers

| AIR QUALITY<br>CONTROL<br>REGION<br>(AQCR) | VOLKSWAGEN<br>% |             |                    | TOYOTA<br>% |                 |                    | DATSUN<br>% |                 |                        |
|--------------------------------------------|-----------------|-------------|--------------------|-------------|-----------------|--------------------|-------------|-----------------|------------------------|
|                                            | AQCR            | VW<br>TOTAL | CUM<br>VW<br>TOTAL | AQCR        | TOYOTA<br>TOTAL | CUM<br>VW<br>TOTAL | AQCR        | DATSUM<br>TOTAL | CUM<br>DATSUM<br>TOTAL |
| CALIFORNIA                                 | 9.97            | 17.15       | 17.15              | 7.47        | 24.19           | 24.19              | 6.30        | 30.32           | 30.32                  |
| HOUSTON                                    | 5.21            | 1.16        | 18.31              | 5.07        | 2.13            | 26.32              | 1.27        | 0.79            | 31.11                  |
| PHOENIX/TUCSON                             | 8.38            | 1.04        | 19.35              | 5.44        | 1.28            | 27.60              | 3.99        | 1.39            | 32.50                  |
| SO LA/TEXAS                                | 5.86            | 1.47        | 20.82              | 4.44        | 2.10            | 29.70              | 1.71        | 1.20            | 33.70                  |
| BOSTON                                     | 7.38            | 2.27        | 23.09              | 4.91        | 2.84            | 32.54              | 1.48        | 1.27            | 34.97                  |
| PHILADAPHIA                                | 8.54            | 2.53        | 25.62              | 2.94        | 1.64            | 34.18              | 1.10        | 0.91            | 35.88                  |
| PORTLAND                                   | 6.60            | 1.21        | 26.83              | 6.39        | 1.69            | 35.87              | 6.50        | 2.56            | 38.44                  |
| FAIRBANKS                                  | 13.35           | 0.04        | 26.87              | 8.30        | 0.047           | 35.92              | 4.34        | 0.036           | 38.48                  |
| BALTIMORE                                  | 5.71            | 1.26        | 28.13              | 2.08        | 0.86            | 36.78              | 2.15        | 1.32            | 39.80                  |
| N.Y./N.J.                                  | 7.49            | 11.35       | 39.48              | 3.13        | 8.93            | 45.71              | 0.60        | 5.07            | 44.87                  |
| SPOKANE                                    | 9.29            | 0.30        | 39.78              | 4.14        | 0.25            | 45.96              | 6.54        | 0.59            | 45.46                  |
| DENVER                                     | 8.90            | 1.12        | 40.90              | 5.36        | 1.27            | 47.23              | 3.66        | 1.29            | 46.75                  |
| WASH. D.C.                                 | 6.59            | 2.04        | 42.94              | 2.43        | 1.42            | 48.65              | 2.10        | 1.82            | 48.57                  |
| PITTSBURGH                                 | 11.27           | 2.80        | 45.74              | 1.84        | 0.86            | 49.51              | 1.28        | 0.89            | 49.46                  |
| SEATTLE                                    | 8.33            | 1.03        | 46.77              | 6.19        | 1.44            | 50.95              | 5.53        | 1.91            | 51.37                  |
| MINNEAPOLIS                                | 4.48            | 0.86        | 47.63              | 2.19        | 0.79            | 51.74              | 0.67        | 0.36            | 51.73                  |
| SALT LAKE CITY                             | 8.71            | 0.48        | 48.11              | 5.83        | 0.60            | 52.34              | 3.18        | 0.49            | 52.22                  |
|                                            | 8.17            | 48.09       | --                 | 4.72        | 52.32           | --                 | 3.17        | 52.20           | --                     |

5 to 10 percent of their total car sales, while the foreign manufacturers' sales are in the 17 to 30 percent range. If all regions shown were to be controlled, the domestic manufacturers would have from 24 to 33 percent of their total car sales affected, while the foreign manufacturers would have from 48 to 52 percent. Thus, either control strategy would have a greater impact on foreign manufacturers in terms of the proportional number of new cars involved in United States sales. However, it should be noted that the United States sales of these companies are a relatively small portion of their overall passenger car output (e.g., Nissan ~8.62%, Toyota ~10.11%, Volkswagen ~15.09%).

## 2.2 AIR QUALITY EFFECTS

The effects of delaying the implementation of the 1975 Federal auto emissions standards for one year on the air quality of 20 metropolitan areas (at the end of 1975) are summarized in Tables 4, 5, and 6. The values in these tables reflect consideration of the 1975 Federal auto emission standards only; no allowance is made for retrofit, transportation control

Table 4. Air Quality Benefits--CO (by Air Quality Control Region)

| CITY                 | 1970 CO<br>ppm MAX* | 1975 CO<br>1-yr DELAY**<br>ppm* | 1975 CO<br>NO DELAY<br>ppm* | CO<br>REDUCTION<br>NO DELAY ppm* |
|----------------------|---------------------|---------------------------------|-----------------------------|----------------------------------|
| LOS ANGELES          | 41.0                | 31.0                            | 28.1                        | 2.9                              |
| SAN FRANCISCO        | 13.0                | 9.8                             | 8.9                         | 0.9                              |
| SAN DIEGO            | 16.0                | 12.1                            | 11.0                        | 1.1                              |
| SACRAMENTO           | 22.0                | 16.6                            | 15.1                        | 1.5                              |
| HOUSTON              | NO PROBLEM          | --                              | --                          | --                               |
| PHOENIX/TUCSON       | 39.0                | 29.7                            | 27.0                        | 2.7                              |
| S. LA. AND SE TEXAS  | NO PROBLEM          | --                              | --                          | --                               |
| BOSTON               | 22.4                | 16.9                            | 15.3                        | 1.6                              |
| PHILADELPHIA         | 21.8                | 16.3                            | 14.8                        | 1.5                              |
| PORTLAND             | 22.5                | 17.0                            | 15.4                        | 1.6                              |
| FAIRBANKS            | 32.2                | 24.3                            | 22.1                        | 2.2                              |
| BALTIMORE            | 20.6                | 15.6                            | 14.1                        | 1.5                              |
| N.Y.C. AREA          | 45.0                | 34.0                            | 30.8                        | 3.2                              |
| SPOKANE              | 19.4                | 14.5                            | 13.2                        | 1.3                              |
| DENVER               | 11.0                | 10.6                            | 8.8                         | 1.8                              |
| WASHINGTON, D.C.     | 23.5                | 18.0                            | 16.4                        | 1.6                              |
| PITTSBURGH           | 24.2                | 18.3                            | 16.6                        | 1.7                              |
| SEATTLE              | 20.0                | 15.1                            | 13.7                        | 1.4                              |
| MINNEAPOLIS/ST. PAUL | 20.1                | 15.0                            | 13.6                        | 1.4                              |
| SALT LAKE CITY       | 19.5                | 18.2                            | 15.3                        | 2.9                              |

\*All concentrations averaged over 8 hr

\*\*Federal car program only. No retrofit, transportation strategies, etc., and at end of 1975 production

Table 5. Air Quality Benefits--Oxidant (by Air Quality Control Region)

| CITY                 | 1970 OX<br>ppm MAX* | PERCENT<br>MOBILE HC** | 1975 OX<br>1-yr DELAY***<br>ppm* | 1975 OX<br>NO DELAY<br>ppm* | OX<br>REDUCTION<br>NO DELAY ppm* |
|----------------------|---------------------|------------------------|----------------------------------|-----------------------------|----------------------------------|
| LOS ANGELES          | 0.67                | 71                     | 0.501                            | 0.479                       | 0.022                            |
| SAN FRANCISCO        | 0.30                | 59                     | 0.237                            | 0.229                       | 0.008                            |
| SAN DIEGO            | 0.40                | 84                     | 0.280                            | 0.265                       | 0.015                            |
| SACRAMENTO           | 0.24                | 60                     | 0.189                            | 0.182                       | 0.007                            |
| HOUSTON              | 0.324               | 22                     | 0.296                            | 0.292                       | 0.004                            |
| PHOENIX/TUCSON       | 0.145               | 60                     | 0.114                            | 0.110                       | 0.004                            |
| S. LA. AND SE TEXAS  | 0.13                | 24                     | 0.119                            | 0.118                       | 0.001                            |
| BOSTON               | 0.211               | 44                     | 0.176                            | 0.171                       | 0.005                            |
| PHILADELPHIA         | NO PROBLEM          | --                     | --                               | --                          | --                               |
| PORTLAND             | 0.14                | 66                     | 0.107                            | 0.103                       | 0.004                            |
| FAIRBANKS            | NO PROBLEM          | --                     | --                               | --                          | --                               |
| BALTIMORE            | 0.26                | 64                     | 0.201                            | 0.193                       | 0.008                            |
| N.Y.C. AREA          | 0.18                | 69                     | 0.136                            | 0.130                       | 0.006                            |
| SPOKANE              | NO PROBLEM          | --                     | --                               | --                          | --                               |
| DENVER               | 0.13                | 66                     | 0.113                            | 0.106                       | 0.007                            |
| WASHINGTON, D.C.     | 0.16                | 88                     | 0.110                            | 0.103                       | 0.007                            |
| PITTSBURGH           | 0.17                | 77                     | 0.123                            | 0.117                       | 0.006                            |
| SEATTLE              | NO PROBLEM          | --                     | --                               | --                          | --                               |
| MINNEAPOLIS/ST. PAUL | NO PROBLEM          | --                     | --                               | --                          | --                               |
| SALT LAKE CITY       | NO PROBLEM          | --                     | --                               | --                          | --                               |

\*All concentrations averaged over 1 hr

\*\*includes heavy duty vehicles

\*\*\*Federal car program only. No retrofit, transportation strategies, etc., and at end of 1975 production

strategies, etc. All CO concentrations are assumed to be due to mobile sources and the oxidant concentrations are assumed to be directly proportional to HC concentrations. Air quality data are based on either the state implementation plans or the TRW/GCA study of 14 metropolitan areas.

Table 4 indicates that the improvement (reduction) in CO resulting from no delay in the standards is not large (1-3 ppm); approximately 10 percent in general. Similarly, as shown in Table 5, the improvement (reduction) in oxidant resulting from no delay in the standards is generally less than 5 percent (0.001-0.02 ppm). Therefore, there is no dramatic improvement in air quality in these metropolitan areas with or without the two-car strategy.

Table 6 ranks the cities examined in order of greatest benefit in air quality due to no delay in the standards. In the case of CO, attention is drawn to the fact that high concentrations of CO occur in a confined local

Table 6. Cities with Greatest Air Quality Improvement--  
No Delay\*

| RANK | CITY                     | IMPROVEMENT<br>IN CO, ppm<br>1975 vs 1974 STD |
|------|--------------------------|-----------------------------------------------|
| 1    | N.Y.C. AREA              | 3.2                                           |
| 2    | LOS ANGELES              | 2.9                                           |
|      | SALT LAKE CITY           | 2.9                                           |
| 3    | PHOENIX/TUCSON           | 2.7                                           |
| 4    | FAIRBANKS                | 2.2                                           |
| 5    | DENVER                   | 1.8                                           |
| 6    | PITTSBURGH               | 1.7                                           |
| 7    | BOSTON                   | 1.6                                           |
|      | PORTLAND                 | 1.6                                           |
|      | WASHINGTON, D.C.         | 1.6                                           |
| 8    | SACRAMENTO               | 1.5                                           |
|      | BALTIMORE                | 1.5                                           |
|      | PHILADELPHIA             | 1.5                                           |
| 9    | SEATTLE                  | 1.4                                           |
|      | MINNEAPOLIS/<br>ST. PAUL | 1.4                                           |
| 10   | SPOKANE                  | 1.3                                           |
| 11   | SAN DIEGO                | 1.1                                           |
| 12   | SAN FRANCISCO            | 0.9                                           |

| RANK | CITY                   | IMPROVEMENT<br>IN OXIDANT, ppm<br>1975 vs 1974 STD |
|------|------------------------|----------------------------------------------------|
| 1    | LOS ANGELES            | 0.022                                              |
| 2    | SAN DIEGO              | 0.015                                              |
| 3    | SAN FRANCISCO          | 0.008                                              |
|      | BALTIMORE              | 0.008                                              |
| 4    | SACRAMENTO             | 0.007                                              |
|      | DENVER                 | 0.007                                              |
|      | WASHINGTON, D.C.       | 0.007                                              |
| 5    | N.Y.C. AREA            | 0.006                                              |
|      | PITTSBURGH             | 0.006                                              |
| 6    | BOSTON                 | 0.005                                              |
| 7    | HOUSTON                | 0.004                                              |
|      | PHOENIX/TUCSON         | 0.004                                              |
|      | PORTLAND               | 0.004                                              |
| 8    | S. LA. AND<br>SE TEXAS | 0.001                                              |

\*No delay in implementing 1975 emission standards

area, as illustrated in Figure 4 for the Denver area. Optimal control, then, may not be the control of the entire air basin and, also, the improvements in CO shown in Tables 4 and 6 may not be truly realizable in these local areas.

In terms of improvement in oxidant level, the State of California would appear to benefit most by being a control region in that four of its cities (Los Angeles, San Diego, San Francisco, and Sacramento) are among the seven cities with the greatest improvement in oxidant level; three of the California cities (Los Angeles, San Diego, and San Francisco) are in the top four in terms of oxidant improvement potential produced by compliance with 1975 emissions standards.

The results shown in Tables 4, 5, and 6 should be evaluated with due consideration to the quality of the measured CO and oxidant concentrations and the assumptions used in the projection methodology. Some

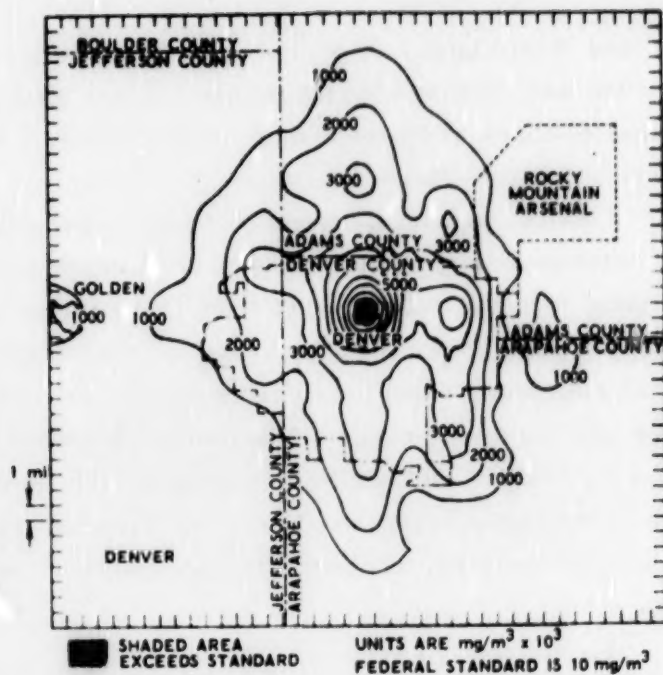


Figure 4. Example of High CO Concentrations in Confined Local Area (Denver)

of the factors that affect the accuracy, or at least the significance, of the measured data are the location and elevation of the surveillance equipment, vagaries of weather, traffic flow, and congestion. A baseline year may not be representative of average conditions.

Regarding the extrapolation calculations to 1975, several inherent inaccuracies are apparent and their effects should be evaluated when more complete data are available. For example, the emission factors are based on national averages for vehicle age distributions, miles driven per year, etc., and do not take into account local variations. Another consideration is the assumption of a direct proportionality between HC emissions and oxidant level. When data for the Houston area are compared to corresponding HC-oxidant envelopes for Los Angeles, Denver, Cincinnati,

Philadelphia, and Washington, it is clear that there is no simple universal correlation of HC and oxidant concentrations. Since EPA does allow a simple proportional rollback of HC to reduce oxidant levels, the relationship is used in this study for convenience.

Finally, a possible source of large error is the fact that CO emissions of catalyst-equipped cars may be very high at low vehicle speeds due to insufficient exhaust mass flow to keep the catalyst temperature up to the value necessary for good efficiency. Actual New York City test data indicate the CO emissions from catalyst-equipped cars rise sharply in the idling and stop-and-go speed range. Maximum CO concentrations in urban areas occur as a result of bad traffic congestion. These effects are not accounted for in the methodology used herein. Similar potential effects of high altitude and low ambient temperature on catalysts are also not accounted for.

### 2.3

#### CAR MOVEMENT AND MIGRATION FACTORS

Daily car travel into and out of air quality control regions and the annual migration of cars into such regions may both be important factors to be considered in the two-car strategy. These factors are presented in Table 7 for each control region along with daily car miles per capita. Daily car travel across the control region boundaries is shown relative to all car trips within the region and is labeled "% Trips External."

As can be seen from the table, 90 percent or more of daily car travel is within the control region, implying that the majority of vehicles within a control region would tend to stay there most of the time. The percent of cars migrating into a region from out of state is quite low (5 percent or less), also emphasizing the degree of movement stability of cars within a given region.

### 3.

#### POTENTIAL COMPLIANCE ASSURANCE MEASURES

A number of approaches are possible to assure compliance with the two-car strategy, including use of existing or modified car

Table 7. Car Movement Summary

| AIR QUALITY<br>CONTROL REGION | DAILY CAR<br>MILES PER CAPITA | % DAILY<br>TRIPS EXTERNAL | % CAR<br>IN MIGRATION* |
|-------------------------------|-------------------------------|---------------------------|------------------------|
| CALIFORNIA                    | 17.1                          | --                        | 2.2                    |
| SOUTH COAST (L.A.)            | 15.0                          | 0.67                      | 2.5                    |
| HOUSTON                       | 16.5                          | 1.3                       | 3.7                    |
| PHOENIX-TUCSON                | 13.5                          | 2.7                       | 5.1                    |
| SO. LOUIS-TEXAS               | 8.1                           | --                        | 2.7                    |
| SAN FRANCISCO                 | 13.8                          | 1.7                       | 3.0                    |
| BOSTON                        | 11.1                          | 8.5                       | 2.3                    |
| SAN DIEGO                     | 13.8                          | 5.0                       | 5.0                    |
| PHILADELPHIA                  | 8.2                           | 10.0                      | 1.5                    |
| PORTLAND                      | 8.2                           | 9.0                       | 4.0                    |
| SACRAMENTO                    | 15.1                          | 7.5                       | 3.2                    |
| FAIRBANKS                     | --                            | --                        | --                     |
| BALTIMORE                     | 9.5                           | <10.0                     | 2.7                    |
| NEW YORK                      | 7.4                           | 5.0                       | 2.5                    |
| SPOKANE                       | 12.0                          | <9.0                      | 5.4                    |
| DENVER                        | 11.3                          | 6.4                       | 4.0                    |
| WASHINGTON                    | 12.0                          | 8.0                       | 2.3                    |
| PITTSBURGH                    | 8.8                           | <9.0                      | 1.6                    |
| SEATTLE                       | 13.5                          | 7.0                       | 5.0                    |
| MINNEAPOLIS-ST. PAUL          | 14.0                          | 3.8                       | 2.4                    |
| SALT LAKE CITY                | 15.8                          | 8.5                       | 5.1                    |

\*Out-of-state registrations

registration procedures, direct control of car dealers, car inspection, and required retrofit of higher emission cars operating in controlled regions. However, implementation of these procedures will require additional state legislation, new federal regulations, and expansion of state enforcement agencies if 100 percent compliance is required.

### 3.1 VEHICLE REGISTRATION

Since all states require annual registration of new and used cars, a pre-registration requirement that purchasers of new cars which are to be used in controlled regions show compliance appears relatively straightforward. Unfortunately, existing registration procedures in most states are not capable of being used without modification. In particular:

- a. Very little effort is made to ensure that all cars are in fact registered, nor are penalties for late registration severe.

Enforcement is primarily through normal police or highway patrol traffic activities such as stopping cars for speeding and reckless driving and reporting and investigating accidents.

- b. Although all states require an address for car registration, none are able to verify that such an address exists, and an applicant's legal address is not required. For purposes of car registration, a mailing address or post office box or second home or business address is valid.
- c. Only California requires that emission control compliance (Equipment Installation Verification) be shown prior to registration. In general, compliance requirements for new cars would be those specified by EPA for the region where the car was sold. Unfortunately, once a new car is registered in another state, it becomes a "used" car. Individuals may therefore evade any new car pre-registration emission control regulations by registering a new car in a non-controlled adjoining state and bringing the car into a controlled area for permanent residence.

To use existing state car registration procedures for ensuring compliance with a two-car strategy, expansion of state enforcement capabilities would be required. In addition, new federal regulations would be required to prevent out-of-state new car sales and registration.

### 3.2

#### DEALER CONTROL

In this approach new car dealers would be required to verify that all new cars being sold are properly equipped for the region in which they will operate and, in particular, that residents of controlled regions are provided low-emission cars.

Dealers might determine which car to sell by confirming a purchaser's legal address using such information as driver's license, place of employment, or IRS address. If, in addition, dealers in controlled areas were provided only with low-emission cars, this approach could make it difficult to evade the two-car strategy. At present, in California, all new cars come equipped with the "California Package" and dealers are not permitted to sell new cars unless this package of equipment is operating when sold.

The difficulties with this approach are:

- a. Most dealers are poorly equipped to determine their customers' legal residence or the primary area in which the car would be used.
- b. New legislation with strong enforcement provisions would be required to ensure dealer compliance.
- c. Fleet car buyers who normally purchase and register in one area for use in another might be required to purchase and register locally.

3.3

#### VEHICLE INSPECTION

All new cars in a given controlled region might be inspected periodically to ensure that they have proper emission control devices. Inspection with certification could be required as a prerequisite for annual car registration. Such an inspection program would require new legislation and additional funding in all states except New Jersey. In addition, modifications in registration procedures would be required.

3.4

#### VEHICLE RETROFIT

A program might be established to require that all 1975 higher-emission cars which enter a controlled region be retrofitted to meet the region's emission standards prior to registration. New state legislation would be required to make retrofit mandatory and a prerequisite for registration. The experience of California in setting standards, testing retrofit devices, and obtaining legislative action indicates that it would take at least two years after the introduction of 1975 cars to implement a retrofit program.

3.5

#### MEASURES REQUIRED OUTSIDE CONTROL REGION

There are strong indications that higher-emission 1975 cars may cost significantly less than new cars required in controlled regions. Higher car costs combined with the fact that many non-controlled regions may have lower taxes or fees, and that new car dealers in controlled regions can legally make agreements with their counterparts outside such regions to

send customers in return for a "finder's fee," indicate that evasion of two-car strategy restrictions may be widespread. For example, Oregon, which borders California, provides incentives for out-of-state new car buyers through having no state sales tax and low registration fees. A number of potential control regions are interstate, with each state having different sales and local taxes, all within easy driving distance of non-controlled areas.

Therefore, if the two-car strategy is to be completely successful, certain controls over car registration and sales outside these control regions are needed. In particular, non-residents of states outside controlled regions should not be permitted to register higher-emission cars unless they can show that the principal use of the car would be in that state, and sales of such higher-emission cars should be prohibited to residents of controlled regions.

In addition, catalyst-equipped low-emission cars will require unleaded gasoline. Therefore, unleaded gasoline should be available both within and outside of controlled regions if residents of these regions are to be able to freely use their cars on trips to other parts of the country.

#### 4. AUTO INDUSTRY CONSIDERATIONS

##### 4.1 GENERAL ATTITUDE TOWARD/ABOUT TWO-CAR STRATEGIES

With the exception of Chrysler (which opposes any strategy requiring the use of catalysts), the domestic auto manufacturers are generally in favor of the California-only two-car strategy. This strategy would only impact from 5 to 10% of each manufacturer's production. The same companies are generally opposed to any California-plus strategy, primarily on the basis of assembly, distribution, and marketing difficulties. If the California-plus strategy were implemented, however, the opinion of these companies is that any added geographical areas should be as large as possible.

On the other hand, the foreign automakers are generally opposed to any mandatory two-car strategy; they prefer optional phasing-in

processes for catalysts. With regard to the California-only strategy they feel that the percentage of their U.S. car sales in California is much too large to represent test case purposes (e.g., Nissan ~30%, Toyota ~24%, VW ~17%). Their distribution and marketing problems would further escalate under the California-plus strategy; Nissan states that such problems would be "too big to imagine." However, their car sales in California are a relatively small portion of their overall passenger car output (e.g., Nissan ~5.01%, Toyota ~4.67%, Volkswagen ~5.38%).

4.2

#### ABILITY TO PRODUCE TWO CLASSES OF NEW CARS

There is generally no question but that two classes of cars can be produced; however, there is an associated degree of difficulty which varies with the size of the auto company. It is more of a problem as the company gets smaller (Nissan feels that they might not have adequate lead time to get two types of cars on the assembly line). The California-only strategy, aside from catalyst-system-unique production problems, is not unusual in this regard since the auto companies have worked with California-unique emission control systems since 1966. The California-plus strategy would involve more assembly plants for catalyst-equipped cars and entail additional complexity. Additional assembly plants would have to be converted to two car lines; cross-shipping of cars may also be required (at additional consumer expense).

4.3

#### ABILITY TO MARKET AND SERVICE NEW CARS

As with the case of car production, again there is generally no question but that two classes of new cars can be marketed and serviced. There is, however, a major impact resulting from the number of control regions involved in a two-car strategy. The California-only strategy, again except for catalyst-system-unique parts and service requirements, has been in effect since 1966 with marketing and service groups set up to handle the California region effectively.

The California-plus strategy may be highly disruptive of distribution, sales, and service channels unless the additional areas are sufficiently large. It is not an impossible task, but it may be very difficult to provide a full model mix of new cars and adequate service to all cities involved in such a strategy. The degree of difficulty, of course, would increase with the increasing number of added control areas.

The car pricing policy has not as yet been determined (e.g., low-emission car owners charged total cost versus spreading cost out over all cars); it has been suggested by General Motors that the catalyst could best be handled as a "mandatory option" as was done in California for other emission control components.

According to Ford, the warranty interpretation under the two-car strategy would remain as is (replace defective parts).

#### 4.4

#### CALIFORNIA-ONLY STRATEGY COMMENTS

##### SUMMARY

Claimed benefits for the California-only strategy include:

- a. It provides more learning about technical unknowns.
- b. It is the logical next step to current developmental test fleets.
- c. It is the closest thing to the normal industry approach for introducing new and unproven designs.
- d. If problems develop only a limited percent of the total United States car sales would be affected (5 to 10% for domestic manufacturers; up to 30% for foreign manufacturers).
- e. It lessens assembly-line impact.
- f. Service parts distribution and training can be more thoroughly evaluated in a limited area.
- g. In the event of a recall or modification, all vehicles would be in one geographical area.
- h. It has certain potential economic benefits, e.g., it would guard against the cataclysmic effects of failures across the total production line; the knowledge gained on initial catalyst designs would allow revisions for lower cost production; it would provide a statistical base for projected

warranty-recall costs at limited risk (5-10% of sales in California for major U.S. automakers).

- i. It would be a continuation of a California-only two-car strategy begun in 1966 which has been shown to be workable.

Claimed disadvantages for the California-only strategy include:

- a. The one-year time period may not permit enough mileage accumulation on catalyst systems.
- b. California sales of some imports are much larger than those of domestic automakers, thus posing a more severe burden on foreign automakers (e.g., 30% of Nissan's sales, 24% of Toyota's sales, and 17% of Volkswagens' sales are in California). However, their California car sales are a much smaller percentage of their overall passenger car output (e.g., Nissan ~5.01%, Toyota ~4.67%, Volkswagen ~5.38%).

#### 4.5

#### CALIFORNIA-PLUS STRATEGY COMMENTS SUMMARY

No benefits are stated or claimed by the auto industry for the California-plus strategy. Previous General Motors support for a California-plus strategy was based on different 1975 emission standards which in all likelihood would not have involved the use of catalysts.

Claimed disadvantages for the California-plus strategy include:

- a. It increases manufacturing and distribution problems.
- b. It involves a complex and difficult enforcement system.
- c. It is very disruptive of normal channels of distribution, sales, and enforcement.
- d. Any areas added to California would have to be large geographical areas; the strategy gets less and less feasible as control regions get smaller.
- e. Nissan claims the problems of a California-plus strategy are "too big to imagine," from their point of view.

## 5. STATE OR REGIONAL CONSIDERATIONS

The following paragraphs summarize the state or regional issues concerning the two-car strategy options as they impact the various jurisdictions that are candidates for control.

### 5.1 REACTIONS TO TWO-CAR STRATEGY

The California-only strategy impacts the air quality implementation plans of other states. The impact varies in degree, depending upon the contribution of vehicle sources to the degradation of air quality in the candidate control regions. For example, the impact is more significant in the New York Metropolitan area than in the Minneapolis/St Paul region.

The complications associated with the implementation and administration of a regional control strategy for a one-year period are such that many states would prefer the option of accepting 1974 automobile exhaust emission levels for 1975 model year cars, provided that the schedule for meeting national air quality goals were extended. For nearly all of the candidate control regions, an additional year of new car emissions at the 1974 level would have a relatively small effect on air quality and therefore would be acceptable.

Most states regard regional control within the state to be an unmanageable proposition in at least two respects. One of these concerns public reaction within and outside of the region selected for control; the other concerns the lack of appropriate legislation and authority for implementing, administering, and enforcing a local control program. Many states such as New York, Texas, Massachusetts, and Utah feel that control of a metropolitan region would not be acceptable unless all similarly affected metropolitan areas within the state were also designated as control zones. Another common objection to the regional approach was the difficulty of maintaining the integrity of zone control in the face of a significant price difference between the two classes of new cars. Arguments against a broad-based control region were raised in those areas where auto pollution problems are

concentrated in small central business districts. Most frequently, however, uniform control throughout the state was preferred to the regional control approach.

The majority of states or regions favored the California-only strategy. An exception was New York City, where, in the Manhattan area, new cars and taxis represent an exceptionally large fraction of the total vehicle population. Washington, D. C. argued in favor of 1975 exhaust emission standards, but conceded that the administrative complications in setting up a regional control program outweighed its value for a one-year application.

California would accept a statewide California-only strategy for a one-year period provided that EPA mandates a supply of non-leaded gasoline throughout the nation. However, the state had serious reservations about being saddled with an emission control system which may ultimately prove unsuitable. A regional control strategy within the state was rejected as unworkable.

## 5.2

### BACKGROUND/EXPERIENCE RELATED TO VEHICLE CONTROL

Some degree of experience and background in vehicle control and surveillance may be found in every state. However, California is uniquely equipped in terms of experience and regulatory procedures for the administration of a regional emission control program. For example, California presently has both a regionally based and a statewide-based retrofit program. Compliance with state emission laws is a requirement for vehicle registration. A system of state-licensed garages capable of certifying emission equipment on a functional basis has been established. An on-highway emission inspection program is in the pilot stage of development. The state has established procedures and a current program for assembly line inspection. Legislation for enforcement and penalties for violation of emission laws have been enacted. However, with all of these experience factors and existing capabilities, much new legislation would be required to implement the proposed two-car strategy.

Washington, D. C. , has a mandatory yearly inspection program for D. C. government vehicles that is tied to the existing safety inspection program required for all D. C. passenger cars; a pilot program for private vehicles submitted on a voluntary basis is underway. New Jersey's emission inspection program, also tied to safety inspection, becomes fully effective commencing July 1, 1973. Regional emission inspection programs that are tied to areas with severe automobile pollution problems are proposed in the implementation plans of a number of states such as Oregon, Washington, and Arizona. These programs, when linked with vehicle registration, represent the means by which two-car strategy control may be implemented.

A number of states have a mandatory periodic safety inspection program. Few of these programs are tied to vehicle registration. However, those of New York and New Jersey are two exceptions.

No existing regulations require proof of residency for registration. A number of states do not identify the domicile of the vehicle by county or other jurisdiction. Accordingly, new laws and procedures would need to be developed in each of the areas proposed for control.

Nowhere are retrofit programs in force except in the State of California. Regional retrofit programs have been proposed in some areas including New York City and Washington, D. C. The possibility of implementing these proposed retrofit programs by 1975 seems extremely remote.

5.3

#### REGION-PECULIAR FACTORS

Region-peculiar factors include:

- a. California's size, population distribution, and border situation lends itself to two-car strategy control.
- b. The proximity of population centers in a number of east coast regions requires interstate control zones in order to realize a beneficial effect on air quality.
- c. Many of the air quality control regions considered for control are largely rural with only localized mobile source pollution problems.
- d. Unique situations exist in Alaska and Colorado. With regard to Alaska, catalyst control systems may not be

effective for the Alaska cold weather and CO and ice-fog problems. Colorado and other high-altitude areas require waivers to adjust emission control settings for high-altitude effectivity and vehicle driveability.

## 6. VEHICLE USER EFFECTS

The low-emission and higher-emission 1975 new car classes will differ in a number of characteristics including emission control equipment, cost, and operations. Many of these differences are not yet known in detail, primarily because they will be affected by policy decisions not as yet made. The following sections discuss possible differences between the two types of cars and their likely effects on the vehicle user. In general it appears that users of low-emission 1975 cars will have higher initial and operating costs and more difficulties in resale than owners of higher-emission 1975 cars unless specific policies are implemented to ameliorate these burdens. Policies that would lessen the initial cost difference between the vehicles and a requirement to retrofit higher-emission cars that move permanently into controlled regions would help the cost and resale problems of low-emission cars.

### 6.1 HARDWARE AND COST DIFFERENCES

If 1975 Federal standards are to be met in a controlled region, the new 1975 low-emission car will require as a minimum some kind of catalyst system to reduce CO and HC emissions. Depending upon the type and performance of the catalyst system selected, such equipment as the intake manifold, carburetor, and ignition system may be either physically different or have different permanent settings or calibrations. The desirability of retrofitting higher-emission 1975 cars that move permanently into controlled regions will be greatly affected by the type of catalyst emission control system selected. Conversely, a requirement that retrofit be technically and economically feasible could affect catalyst emission control system selection. For example, if both car classes had engine and emission control systems that were identical in components except for the catalytic converter, per se,

and perhaps its air diversion control system, then not only would retrofit be more feasible, but also the cost differences between the car classes would be minimized.

Initial cost differences between the two car classes will depend upon the hardware differences as noted above and also on the car pricing policies followed by the auto companies. Several pricing policies are possible, including:

- a. Low-emission car sold at full cost of emission control system differences.
- b. Cost increases distributed over all cars.
- c. Catalyst control system treated as a "mandatory option" for the low-emission car.

The actual cost differences between the cars will determine the extent of likely evasion of the two-car strategy by 1975 model new car buyers and therefore influence the cost of enforcement.

## 6.2

### OPERATIONAL AND MAINTENANCE DIFFERENCES

Based on the ground rules of this study, both cars will have the same  $\text{NO}_x$  level and therefore about the same fuel consumption characteristics. Also, basic maintenance costs should be similar for both vehicles, in terms of tuneups, etc. However, the reliability of catalyst systems is of great concern and is one of the main reasons auto companies support strategies that will permit a "pilot" program prior to nationwide use. While consumers should be protected by the new car catalyst system warranty, if repairs under this warranty become significant, the auto companies will undoubtedly pass this cost on to consumers through increased initial costs and parts and labor prices. If serious warranty-recall problems did arise the car dealers could get swamped and not be able to render effective service and repair.

### 6.3

#### ABILITY TO MOVE FROM AREA TO AREA WITH GIVEN CAR

Depending upon the policy decisions made and the extent of enforcement, owners of the higher-emission 1975 cars may find that if they permanently move into a controlled region the retrofit or forced sale of their car will be required. Whether this situation will, in fact, occur is dependent upon the final regulations generated for controlling the area of new car sales and on the regulations for used cars in the control region. Since annual migration of cars into possible control regions is normally a small fraction (<5%) of the total number of cars within the region, forced sale or modification of the higher-emission cars may be an unreasonable requirement.

### 6.4

#### RESALE CAPABILITIES

Since car migration is small relative to the total number of cars in a region, most new 1975 cars will likely be sold in their area of original purchase. Therefore, for most sales, there would be no loss in value even for low-emission cars with catalyst systems. However, sales of such cars outside of controlled regions would likely result in loss of the extra cost of the catalyst system (e.g., just as air conditioners lose value in cold regions).

If higher-emission cars are permitted in controlled regions as used cars without retrofit after the one-year, two-car strategy is completed, such cars could undersell the low-emission cars. This could create a strong demand within the controlled region for higher-emission used cars from outside the region, and make difficult the resale of low-emission cars.

Large fleets and leasing companies may experience some financial difficulties because cars assigned to controlled regions would have to be sold in these regions as used cars to prevent loss of value of the catalyst system. Normally, fleet and lease cars are sold wherever there is a market and many times are sold outside the area in which they initially operated.

6.5

#### IMPACT OF REGISTRATION REQUIREMENTS

Generally no impact of registration requirements is foreseen unless inspection and/or maintenance or retrofit is required as a prerequisite to registration. However, if these requirements are not imposed, then increased migration of higher-emission cars into controlled regions may occur for economic reasons, as mentioned above.

In particular, if the initial price of the higher-emission car is much less than that of the low-emission car, some owners may purchase, register, and/or license higher-emission cars out of the state or out of the control region and then bring such a car into the control region as a used car.

6.6

#### IMPACT OF RETROFIT REQUIREMENTS

If retrofit of higher-emission cars brought into a controlled region on a permanent basis is required, various results are possible.

- a. If the policy is not effectively enforced and the costs are high, many owners would be encouraged to violate the laws requiring retrofit.
- b. If the cost of retrofit is high relative to the value of the car, owners of higher-emission cars will likely sell them prior to moving and purchase another car for use in the controlled region. The replacement car could be new or might be a pre-1975 used car. Used cars might be particularly interesting if they could be operated without installation of additional emission control devices.
- c. If the ability to retrofit a higher-emission car is a requirement levied on the automakers, the initial cost of such cars might be increased to cover the costs of retrofit for those cars potentially requiring it. This could result in both car classes being nearly the same in emission control system configuration, except for the catalytic converter.

6.7

#### ABILITY TO ACQUIRE REPLACEMENT PARTS AND SERVICE

Difficulties in obtaining replacement parts (24-hour delays likely) may be encountered by owners of low-emission cars in areas outside the controlled region. In addition, service in such areas from mechanics with little experience with catalyst systems may be of poor quality.

## 6.8

### ABILITY TO ACQUIRE UNLEADED GASOLINE ON TRIPS OUTSIDE OF CONTROL REGION

Low-emission cars require unleaded gasoline for proper operation of their catalyst systems. Present Federal regulations call for unleaded gasoline to be available throughout the nation by July 1974. However, if for any reason, such as the fact that it is uneconomic for stations to stock a fuel for which there is little demand, unleaded gasoline is not generally available outside of controlled regions, then several approaches are possible.

- a. The catalyst system could be designed with a bypass that would be adjusted for use prior to a trip outside the controlled region and closed upon return to the region. To avoid widespread use of the bypass within the controlled region, device adjustments and legal approvals by the state or local region control authorities would likely be required.
- b. For short periods of time, leaded gasoline may not permanently degrade catalyst materials; therefore, in emergency situations its use may be allowed. However, the extent of catalyst degradation would be unknown unless a testing and inspection program was established.
- c. For the few trips that most people would make outside of controlled regions, the use of higher-emission rental cars may be desirable, and perhaps should be encouraged. In a number of situations, such rental cars could provide better service at lower cost than the low-emission family car with a catalyst that requires unleaded gasoline and special parts and service.

## 7. COROLLARY ISSUES

### 7.1 IMPACT ON USED CAR INDUSTRY

The impact on the used car industry will be largely determined by the initial price differential between the low-emission and higher-emission cars and whether retrofit would be required of higher-emission cars that move permanently to controlled regions.

- a. If the cost differences are large, and retrofit is required, most new cars would be traded and sold in the region of

initial purchase or traded between similar regions. There would be little incentive for selling low-emission cars outside control regions because the extra initial cost of their catalyst systems would be lost on such sales, while the retrofit requirement would likely raise the cost of the initially lower priced, higher-emission cars to a level where there would be no cost savings to the purchaser.

- b. If cost differences are large, and retrofit is not required, there would be a strong incentive to sell the lower cost, higher-emission cars in controlled regions, and it may be difficult to resell low-emission cars unless the extra cost of their catalyst systems is absorbed as a loss.
- c. If cost differences are small, and retrofit is required, the higher-emission cars would be pretty much restricted to sales outside of controlled regions. The cost of retrofitting such cars for sale in controlled regions would make them more costly than low-emission cars.
- d. If cost differences are small, and retrofit is not required, migration of the low-emission and higher-emission cars would be pretty much as it is today for used cars, with customer preference determining the movement of cars.

## 7.2

### IMPACT ON REPLACEMENT PARTS INDUSTRY

It is expected that initially there would be no impact, with dealers providing parts from the automakers and original equipment suppliers. However, if, over a period of time, low-emission cars require a high volume of replacement parts to maintain proper operation, new suppliers may enter the market.